Grade 9 Science

ACHIEVEMENT TEST

June 1985

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GRADE 9 SCIENCE
ACHIEVEMENT TEST

GENERAL INSTRUCTIONS

1. This test consists of 75 multiple-choice questions.
2. You will have 90 minutes to complete this test.
3. Calculators may be used.
4. Read each question carefully and follow the specific instructions given.
5. Each question has four possible answers from which you are to choose the CORRECT or BEST answer.
6. Mark your choice on the separate answer sheet provided.
7. Use ONLY an HB pencil to mark your answer.

Example

1. This test is for the subject area of

A. Science
B. Mathematics
C. Physical Education
D. Language and Literature

Answer Sheet

	A	B	C	D
1.	●	○	○	○

8. Mark only one answer for each question. If you change an answer, please erase your first mark completely.
9. Be sure that the number beside the response circles on the answer sheet matches the number of the question you are doing.
10. Your teacher will tell you when to start and when to stop.

DO NOT TURN THIS PAGE UNTIL YOUR TEACHER TELLS YOU TO DO SO

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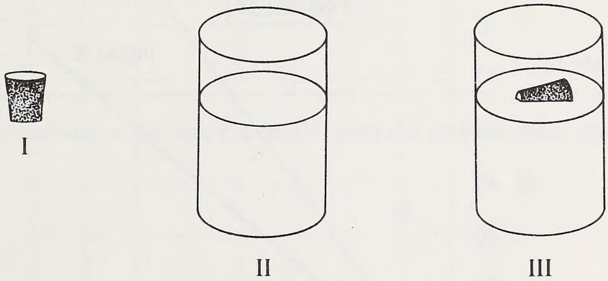
1. As an object moves away from the Earth's surface at a constant velocity, its

A. mass increases
B. mass decreases
C. weight increases
D. weight decreases

Use the following information to answer question 2.



A student weighed a cork (I) and then weighed a small jar of water (II). The student put the cork in the jar of water and weighed the jar of water with the cork floating in it (III).

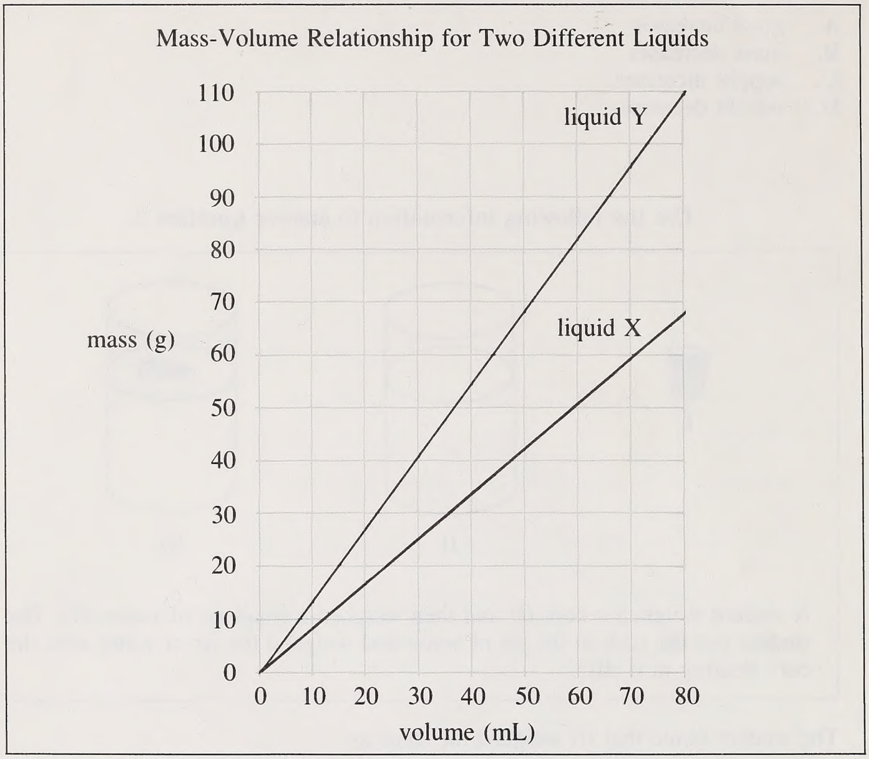
2. The student found that III weighed the same as

A. I
B. II
C. I + II
D. II − I

3. A student was given three blocks of different metals that were labelled Q, R, and Z. Each block had a volume of 20 cm^3. By using an equal-arm balance, the student found that block Q just balanced blocks R and Z when they were placed together. However, block R was not heavy enough to balance block Z. From this information we know that the blocks, in order of increasing density, are

A. Q, R, Z
B. R, Z, Q
C. Z, R, Q
D. R, Q, Z

Use the following information to answer questions 4 to 6.



4. The amount of space 37 g of liquid Y would occupy is

A. 27 mL
B. 30 mL
C. 47 mL
D. 50 mL

5. 55 mL of liquid X would have a mass of

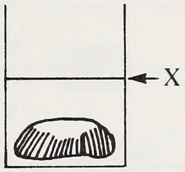
A. 47 g
B. 49 g
C. 65 g
D. 76 g

6. The density of liquid Y is

A. 0.73 g/mL
B. 0.83 g/mL
C. 1.2 g/mL
D. 1.4 g/mL

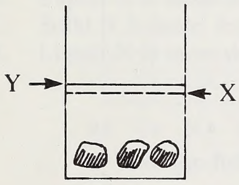
Use the following information to answer question 7.

The diagram shows the water level (X) after a non-porous rock is put into a beaker of water.

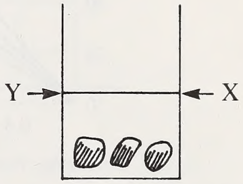


7. The diagram that shows the water level (Y) after the rock has been broken into three pieces is

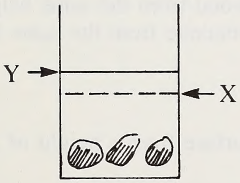
A.



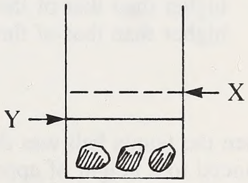
B.



C.



D.



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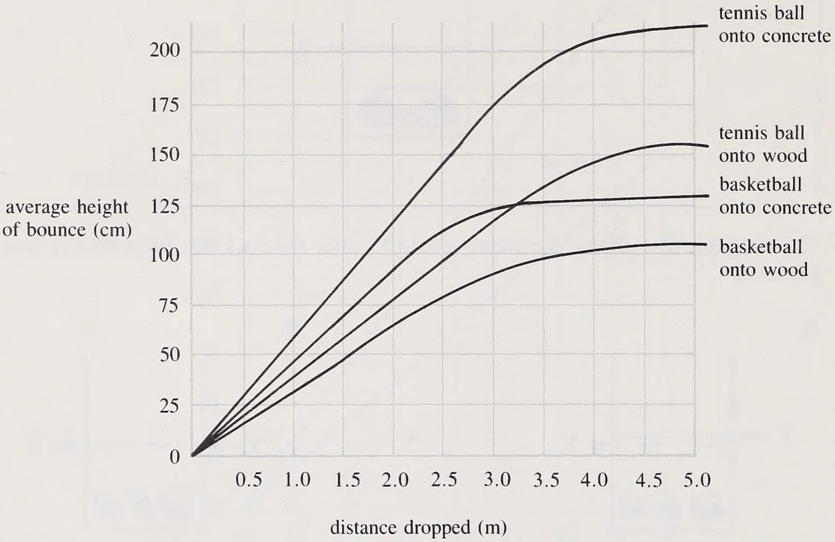
8. Object X weighs twice as much as object Y when both objects are at the same place on Earth. The mass of object X is

A. half that of object Y
B. twice that of object Y
C. four times that of object Y
D. the same as that of object Y

Use the following information to answer questions 9 and 10.

A student decided to study some of the factors that affect the height a ball bounces. A tennis ball and basketball were dropped from different distances onto wood and concrete surfaces. The graph below represents the student's results.



9. When the basketball was dropped onto the concrete surface, its bounce was always

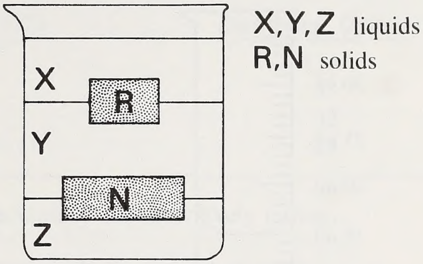
A. lower than that of the tennis ball dropped onto wood from the same height
B. lower than that of the tennis ball dropped onto concrete from the same height
C. higher than that of the tennis ball dropped onto wood from the same height
D. higher than that of the tennis ball dropped onto concrete from the same height

10. When the tennis ball was dropped onto the concrete surface from a height of 2.0 m, it bounced to a height of approximately

A. 80 cm
B. 90 cm
C. 120 cm
D. 130 cm

Use the following information to answer question 11.

Three liquids and two solids settle out in a beaker as shown.

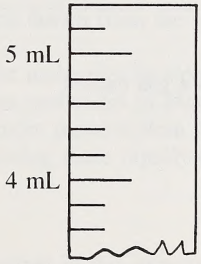


11. Which statement is true?

A. Solid R is more dense than solid N.
B. Liquid Y is more dense than solid N.
C. Solid N is more dense than liquid X.
D. Liquid X is more dense than both solids.

Use the following information to answer question 12.

The diagram illustrates a portion of a graduated cylinder.

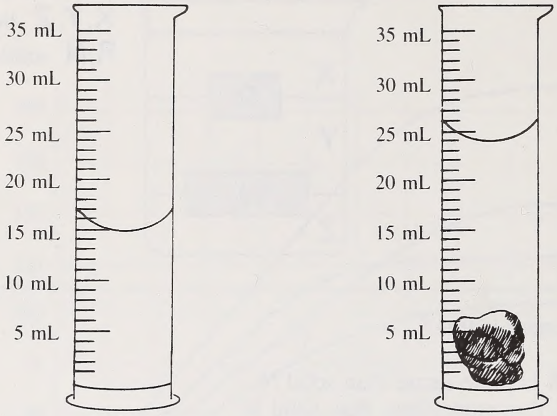


12. Each of the smallest divisions represents

A. 0.1 mL
B. 0.2 mL
C. 0.5 mL
D. 1.0 mL

Use the following information to answer question 13.

The volume of a solid is found using the procedure illustrated.



13. The volume of the solid is

A. 9 mL
B. 15 mL
C. 24 mL
D. 26 mL

---

14. The motion of molecules within a gas causes

A. diffusion
B. sublimation
C. evaporation
D. condensation

15. Gases are much more easily compressed than are liquids or solids. The most acceptable explanation for this observation is that

A. gas molecules are perfectly elastic, and elastic substances are easily compressed
B. gas molecules move at much greater velocities than do the molecules of liquids and solids
C. the average distance between molecules in gases is much greater than that between molecules in liquids and solids
D. the attractive forces between molecules in solids and liquids are much smaller than those between molecules in gases

Use the following information to answer question 16.

A student dissolved seltzer tablets in water at four different temperatures. The dissolving times were recorded in the table below.

Water Temperature (°C)	Dissolving Time (s)
20.0	130
40.0	45
60.0	32
80.0	24

16. Choose the hypothesis that the student was most likely testing.

A. The rate of dissolving varies with the amount of water.
B. The rate of dissolving varies with the temperature of the water.
C. The number of tablets that will dissolve depends upon the amount of water.
D. The number of tablets that will dissolve depends upon the temperature of the water.

Use the following information to answer questions 17 and 18.

In an experiment to compare the evaporation rates of water and alcohol, a student poured the liquids, both at room temperature, into identical petri dishes and let them stand for one hour. The alcohol level was lower than the water level because much more alcohol evaporated than water.

17. The best inference that can be drawn from the results is that the

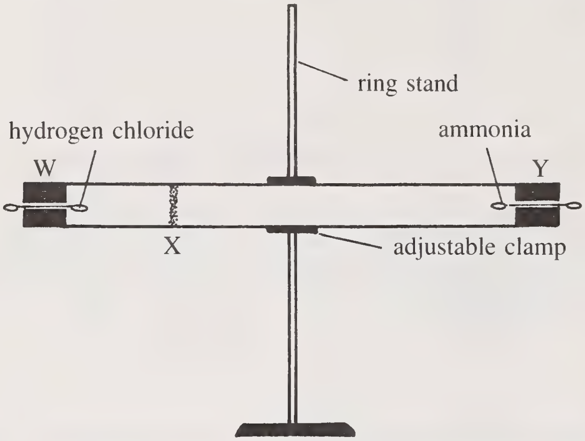
A. attractive forces between molecules in alcohol are weaker
B. attractive forces between molecules in alcohol are stronger
C. alcohol molecules are more massive than the water molecules
D. water molecules are moving more rapidly than the alcohol molecules

18. A variable that was held constant in this experiment is the

A. evaporation rate
B. type of liquid used
C. amount of liquid used
D. amount of liquid evaporated

Use the following information to answer question 19.

Ammonia gas and hydrogen chloride gas react with each other to form a white solid. In the experiment illustrated, hydrogen chloride was introduced at the end of the tube labelled W. At the same time, ammonia was introduced at the end of the tube labelled Y. A ring of white powder formed at point X.



19. What conclusion can be drawn from this experiment?

A. Both types of particles diffuse at the same rate.
B. Hydrogen chloride particles diffuse more rapidly than ammonia particles.
C. Ammonia particles diffuse more rapidly than hydrogen chloride particles.
D. Rate of diffusion does not depend on the masses of the diffusing particles.

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20. When 50.0 mL of alcohol were added to 50.0 mL of water, the resulting volume was 98.0 mL. Which statement can best be used to explain this observation?

A. Spaces exist between molecules.
B. Molecules are constantly moving.
C. All measurements are approximate.
D. Matter has mass and occupies space.

21. Gases differ from solids in that gas molecules

A. have less mass
B. contract when heated
C. have more freedom of motion
D. move more slowly when heated

22. Why does water placed on the skin have a cooling effect?

A. The heat of the water is lost to the air.
B. As it evaporates, the water absorbs heat from the skin.
C. Slower moving water molecules escape into the air as vapor.
D. The water closes the pores of the skin, thus producing a cooling sensation.

23. When molecules that originally vibrate about a fixed position start to slide over one another in random directions, matter changes from a

A. liquid into a gas
B. gas into a liquid
C. solid into a liquid
D. liquid into a solid

24. The rate of evaporation of a liquid can be slowed down by

A. cooling the liquid
B. increasing its surface area
C. blowing air across its surface
D. decreasing the humidity of the air over the liquid

Use the following information to answer question 25.

Consider the list of mixtures below.

I salt in water
II sugar in water
III sand in water
IV noodles in water

25. Which of the mixtures are solutions?

A. I and II
B. I and IV
C. II and III
D. III and IV

---

26. Molecules at room temperature are farthest apart in

A. air
B. oil
C. water
D. steel

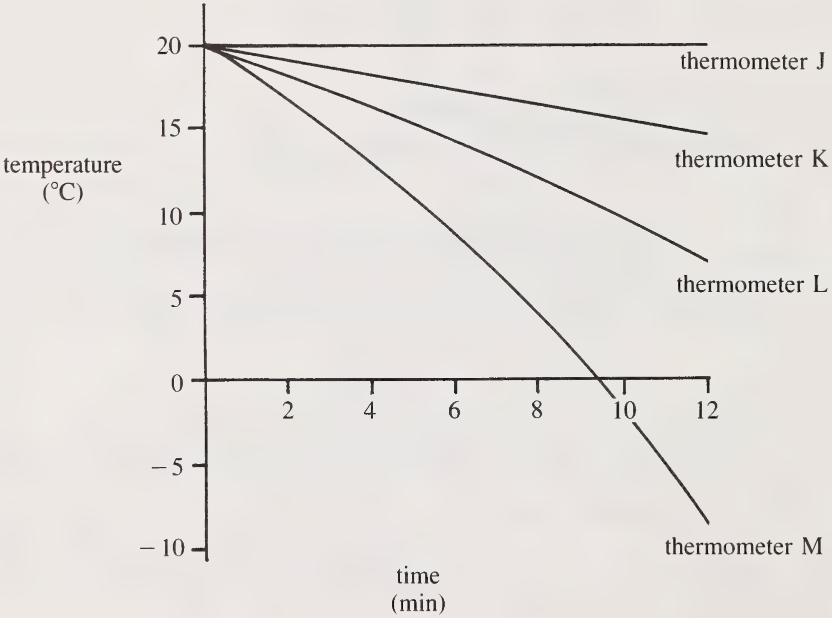
Use the following information to answer questions 27 to 29.

Four thermometer bulbs were each wrapped in a layer of cotton cloth and placed into separate beakers for two minutes.

Thermometer J was placed into a beaker containing air. Thermometer K was placed into a beaker containing liquid K. Thermometer L was placed into a beaker containing liquid L. Thermometer M was placed into a beaker containing liquid M.

After the thermometers were removed from the beakers, the temperature for each thermometer was recorded every minute for 12 minutes.

The results are shown on the graph.



27. What is the problem that was being investigated in this experiment?

A. What effect does the type of cloth have on the rate of evaporation?
B. What effect does the type of liquid have on the rate of evaporation?
C. What effect does the air temperature have on the rate of evaporation?
D. What effect does the quantity of liquid have on the rate of evaporation?

28. The manipulated (independent) variable in this experiment is the

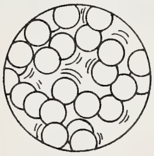
A. type of liquid
B. air temperature
C. cotton wrapping
D. rate of evaporation

29. According to the graph, the substance that has the highest rate of evaporation is

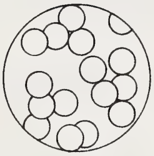
A. air
B. liquid K
C. liquid L
D. liquid M

Use the following information to answer questions 30 and 31.

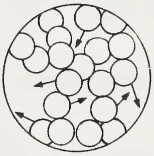
I
Molecules vibrate but maintain position



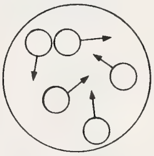
II
Molecules are stationary



III
Molecules slide over one another



IV
Molecules move about freely in a random manner



30. Which diagram is the POOREST representation of particles in matter?

A. I
B. II
C. III
D. IV

31. Which diagram shows how molecules of a liquid behave?

A. I
B. II
C. III
D. IV

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32. As solid copper melts, the molecules

A. gain energy and move farther apart
B. lose energy and move farther apart
C. lose energy and move closer together
D. gain energy and move closer together

33. Absolute zero is defined as the temperature at which

A. all molecular motion ceases
B. pure oxygen turns to a solid
C. the temperature reading is 0°C
D. pure hydrogen turns to a liquid

34. When wet clothes are hung out to dry in winter at temperatures below $-10°C$, the clothes will dry in a few days even though they freeze immediately. This observation provides evidence that

A. cold air only contains solid water molecules

B. it is not always necessary for solids to first change to liquids before becoming vapor

C. water vapor molecules contain less kinetic energy than liquid water molecules at low temperatures

D. water vapor molecules contain more kinetic energy than liquid water molecules at low temperatures

35. How much heat energy is required to raise the temperature of 100 g of water from 15°C to 30°C? Note: Specific heat of water = 4200 J/kg•°C.

A. 21 J
B. 1500 J
C. 6300 J
D. 26 460 J

36. A sheet of rubber is stretched over the mouth of a warm bottle. When the air in the bottle cools, the rubber will

A. solidify
B. bend inward
C. bend outward
D. remain the same

Use the following information to answer question 37.

A student prepared mixtures of water and glycerine, and then determined the freezing point for each mixture as shown in the table below.

Mixture	% Water	% Glycerine	Freezing Point °C
W	100	0	0.0
X	90	10	−1.6
Y	80	20	−4.8
Z	60	40	−15.4

37. It may be inferred from the results that the

A. addition of glycerine to water raises the freezing point of the water
B. freezing point of glycerine is higher than the freezing point of water
C. larger the percentage of glycerine, the higher the freezing point of the mixture
D. larger the percentage of glycerine, the lower the freezing point of the mixture

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38. The boiling point of a substance is 12°C and its melting point is −40°C. At −5°C the substance will be a

A. gas
B. solid
C. vapor
D. liquid

39. A litre of water at 16°C is mixed with a litre of water at 34°C. The temperature of the water just after mixing will most likely be

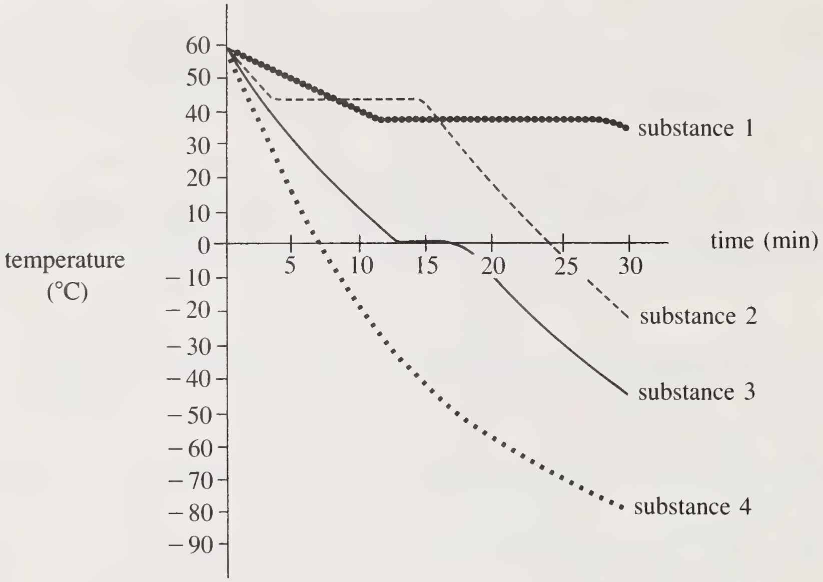
A. 16°C
B. 25°C
C. 34°C
D. 50°C

40. Scientists now explain the temperature of a substance as being an indication of the

A. solubility of the substance
B. amount of caloric fluid in the material
C. average kinetic energy of its molecules
D. tendency of the material to react chemically

Use the following information to answer questions 41 to 43.

While visiting Planet Z, two astronauts found the conditions to be identical to those on Earth, except that the temperature was much higher. As a part of the astronauts' experiments, four different pure substances (liquids at 60°C) in identical open glass beakers were cooled in a bath of dry ice and alcohol. The temperature of each substance was recorded every minute for a period of 30 minutes. After collecting their data, the astronauts prepared the graph shown below.



41. One of the substances used by the astronauts was water. This would be substance number

A. 1
B. 2
C. 3
D. 4

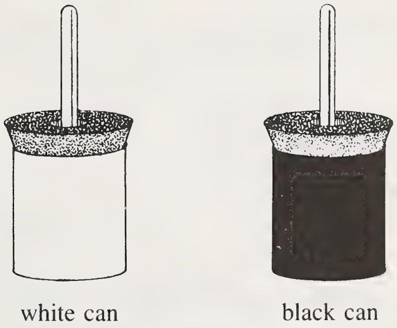
42. The next day, if the temperature went up to 60°C from an overnight low of 30°C, which of the substances would absorb heat from the atmosphere and change state?

A. 1 and 2
B. 1 and 3
C. 2 and 3
D. 2 and 4

43. The substance with the highest freezing temperature will freeze at

A. 40°C
B. 45°C
C. 60°C
D. Insufficient data to determine

Use the following information to answer question 44.



Two cans of identical size and shape are filled with the same amount of water and placed in the sun.

44. At the end of 20 minutes, the temperature of the water in the white can will be

A. higher because the black surface absorbs more heat energy
B. higher because the black surface radiates more heat energy
C. lower because the white surface absorbs more radiant energy
D. lower because the white surface reflects more radiant energy

45. A home gardener found that placing several tubs of water near vegetables in an unheated basement prevented the vegetables from freezing. The best explanation for this observation is that

A. water readily absorbs heat energy
B. it takes a long time for water to freeze
C. the water evaporates, making the air cooler
D. as the water cools, it gives off heat energy

46. Two pans of water are brought to a boil. Eggs of equal size are placed in each and are covered by the water. Although the water in pan I is barely boiling and the water in pan II is boiling vigorously, the eggs cook in the same length of time principally because the

A. pans are the same size
B. pans are made of the same metal
C. pans contain the same amount of water
D. water is at the same temperature in both pans

47. When a railroad is being constructed during cold weather a space is left at the joints between the steel rail sections. The reason for leaving spaces is that as the temperature

A. decreases, the steel rails shrink
B. decreases, the steel rails expand
C. increases, the steel rails shrink
D. increases, the steel rails expand

Use the following information to answer question 48.

> A student put a thermometer into a 1000-mL beaker, and another thermometer into a beaker the same size that was filled with water. Both beakers were left to sit until the thermometers reached room temperature. The beakers were then placed in a refrigerator for six minutes.

48. At the end of three minutes, the student will most likely find that

A. the temperature of the beakers has not changed
B. both beakers are cooled to the same temperature
C. the beaker containing water is colder than the beaker containing air
D. the beaker containing air is colder than the beaker containing water

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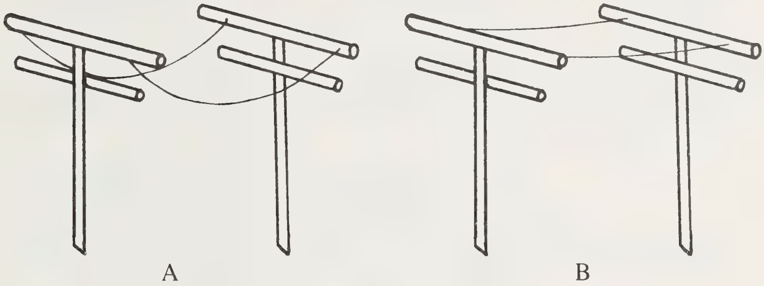
Use the following information to answer question 49.

The diagram shows the same pair of telephone poles at two different seasons in the year.



49. During which season would you most likely observe condition B in Alberta?

A. Spring
B. Summer
C. Fall
D. Winter

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50. A weather balloon increases in volume as it ascends to higher altitudes. In terms of the kinetic molecular theory, the expansion of the balloon is due to

A. an increase in the average kinetic energy of the atmospheric particles

B. a decrease in the average kinetic energy of the particles inside the balloon

C. a decrease in the rate of collisions of atmospheric particles against the outside walls of the balloon

D. an increase in the rate of collisions of atmospheric particles against the outside walls of the balloon

51. The energy of a mass held 10 m above the ground is said to be

A. kinetic
B. chemical
C. potential
D. mechanical

Use the following information to answer questions 52 and 53.

1000 J of electricity were used to work each of four electrical appliances. The energy output was measured and is given in the following table.

Appliance	Energy Input	Energy Output
Electric saw	1000 J electrical energy	500 J mechanical energy 150 J heat energy 350 J sound energy
Vacuum cleaner	1000 J electrical energy	650 J mechanical energy 150 J heat energy 200 J sound energy
Electric mixer	1000 J electrical energy	750 J mechanical energy 120 J heat energy 130 J sound energy
Electric drill	1000 J electrical energy	450 J mechanical energy 250 J heat energy 300 J sound energy

52. What reduces the efficiency of the electric saw?

A. Only heat energy
B. Heat and sound energy
C. Mechanical and heat energy
D. Sound and mechanical energy

53. The most efficient appliance is the

A. electric saw
B. electric drill
C. electric mixer
D. vacuum cleaner

---

54. A marble is dropped from a height of one metre above a level surface. At which position does the marble have the greatest kinetic energy?

A. Just before impact
B. Immediately before it is dropped
C. One-third of its height above the level surface
D. Two-thirds of its height above the level surface

55. The energy change involved in burning is

A. kinetic to heat
B. chemical to heat
C. heat to potential
D. kinetic to potential

56. A student was watching a stonemason split rocks with a hammer and chisel. The student felt the head of the hammer, and it was warm. What is the best explanation?

A. Friction produced heat energy.
B. The mason's glove warmed the hammer.
C. Radiant energy was trapped by the head of the hammer.
D. Heat energy was conducted from the rocks back to the hammer.

57. Which statement about energy is true?

A. Energy can be created and destroyed.
B. Energy of position is called kinetic energy.
C. Energy of motion is called potential energy.
D. Energy can be changed from one form to another.

58. Which statement describes what happens in the reaction
carbon + oxygen → carbon dioxide?

A. Molecules of carbon break up to form a gas.
B. Compounds of carbon and oxygen rearrange to form carbon dioxide.
C. Atoms of the elements carbon and oxygen combine to form a compound.
D. Atoms of the elements carbon and oxygen move farther apart and vaporize.

59. Which of the following is arranged in correct sequence from the smallest to the largest?

A. Electron, molecule, proton, atom
B. Atom, proton, molecule, electron
C. Proton, atom, electron, molecule
D. Electron, proton, atom, molecule

Use the following information to answer questions 60 and 61.

A student observed that some substances when heated in a Bunsen flame gave off light that colored the flame. The observations are shown in the table below.

Trial	Substance	Color of Flame
1	potassium carbonate	purple
2	potassium nitrate	purple
3	calcium oxide	yellow
4	calcium acetate	yellow
5	sodium chloride	yellow
6	strontium chloride	red
7	copper chloride	green
8	copper nitrate	green
9	copper	green

The student concluded that the color of the flame is a characteristic property of an element and does not change when the element is part of a compound.

60. When given an unknown substance that glowed yellow in the flame, the student concluded that the substance contained calcium. This conclusion is

A. supported by the evidence in the table, but more information is needed
B. supported by the evidence in the table, and no more information is needed
C. not supported by the evidence in the table, and more information is needed
D. not supported by the evidence in the table, and no more information is needed

61. Wax pellets that contain compounds such as those in the table can be burned in fireplaces to color the flames. If purple, red, and green are the desired colors, the pellets should contain

A. strontium, copper, and nitrate
B. potassium, nitrate, and strontium
C. potassium, strontium, and copper
D. potassium, sodium, and strontium

---

62. A molecule of water (H_2O) is made up of two different kinds of atoms,

A. two elements, and a total of two atoms
B. two elements, and a total of three atoms
C. two compounds, and a total of two atoms
D. two compounds, and a total of three atoms

Use the following information to answer question 63.

Blue copper sulphate turns white when heated because water is driven off. A student obtained the following results when heating some copper sulphate:

Mass of beaker	48.7 g
Mass of beaker containing unheated copper sulphate	319.0 g
Mass of beaker containing heated copper sulphate	204.2 g

63. What was the mass of water in the unheated copper sulphate?

A. 163.5 g
B. 114.8 g
C. 67.1 g
D. 66.5 g

---

64. To determine whether a substance is a compound, one would probably find which of the following tests LEAST helpful?

A. Heating it
B. Studying it with a microscope
C. Melting it and using an electric current
D. Dissolving it and using an electric current

65. When a certain white chemical is heated, a gas and a brown solid are formed. The white chemical CANNOT be

A. an element
B. a compound
C. a mixture of two substances
D. a mixture of three substances

66. If you know how many of these particles there are in an atom's nucleus, you can find the name of the atom.

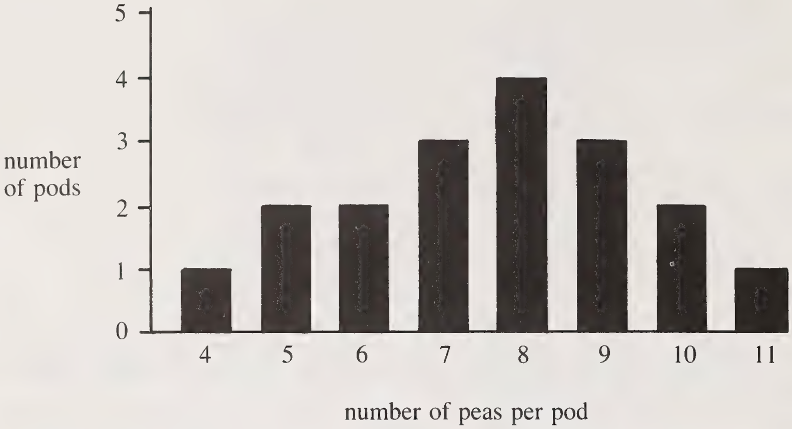
A. Atom
B. Proton
C. Neutron
D. Electron

67. Which change would be most difficult to reverse?

A. Salt dissolving
B. An iron fence rusting
C. Candle wax hardening
D. A block of ice melting

Use the following information to answer questions 68 and 69.

A bar graph illustrates the data obtained from a simple investigation of variation.



68. What was the total number of pods counted in the sample?

A. 4
B. 8
C. 11
D. 18

69. What was the average number of peas in a pod in the above sample?

A. 4.0
B. 5.6
C. 7.6
D. 8.0

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70. If you are using principles learned or demonstrated in a previous experiment to help solve a new problem, you are

A. making a hypothesis
B. identifying a new problem
C. gathering further evidence
D. applying discovered knowledge

Use the following information to answer question 71.

A student did an experiment on the growth of bread mold. The mold was grown in three containers each containing an equal amount of nutrients. One container was kept at 10°C, one was kept at 20°C, and one was kept at 60°C. At the end of four days, the amount of mold in each container was recorded.

71. The hypothesis that can be tested using this procedure is: The amount of bread mold produced depends on the

A. temperature
B. number of days
C. amount of nutrients
D. number of containers

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72. A student is planning an experiment to learn something about the role of potassium in the growth of a certain plant. The student decides to grow one group of these plants in soil containing nitrogen and phosphorus, but lacking potassium. A second group of these plants should be grown in soil that contains

A. potassium only
B. nitrogen, phosphorus, and potassium
C. nitrogen and phosphorus, but no potassium
D. nitrogen and potassium, but no phosphorus

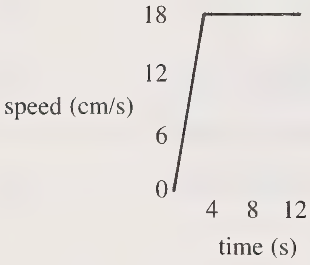
Use the following information to answer question 73.

The data in the table below were collected by a student who studied the movement of a small cart that rolled down a ramp and onto a level surface.

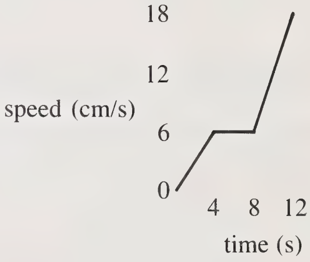
Time (s)	Speed (cm/s)	Total Distance (cm)
0	0	0
1	6	3
2	12	12
3	18	27
4	16	44
5	14	59
6	12	72
7	10	83
8	8	92
9	6	99
10	4	104
11	2	107
12	0	108

73. Which graph shows the speed of the cart as a function of time?

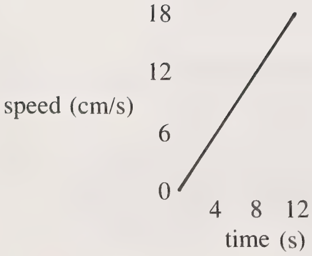
A.



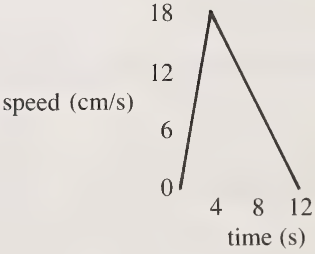
B.



C.



D.



Use the following information to answer question 74.

A Grade 9 Science class listed the variables that they thought might affect the time required to melt an ice cube. The list included:

mass of the ice cube
temperature of the room
shape of the ice cube

One student decided to test the hypothesis that the shape of an ice cube affects the time required to melt the ice cube.

74. Which design should the student select to test this hypothesis?

A. Use five ice cubes, each with a different shape and mass. Use five identical containers, all at the same temperature. Observe the melting time of the ice cubes.

B. Use five ice cubes, all having the same shape, but each having a different mass. Use five identical containers, all at the same temperature. Observe the melting time of the ice cubes.

C. Use five ice cubes, all having the same mass, but each having a different shape. Use five identical containers, all at the same temperature. Observe the melting time of the ice cubes.

D. Use five ice cubes, all having the same mass, but each having a different shape. Use five identical containers, each at a different temperature. Observe the melting time of the ice cubes.

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75. When we say that a scientist formulates a hypothesis about an experiment, we mean that the scientist

A. suggests how to make exact measurements
B. describes how the experiment was carried out
C. makes a careful guess about what will happen
D. gives directions for doing the experiment properly

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